# Child Restraints for Transport Passenger Airplanes: Design and Performance Issues

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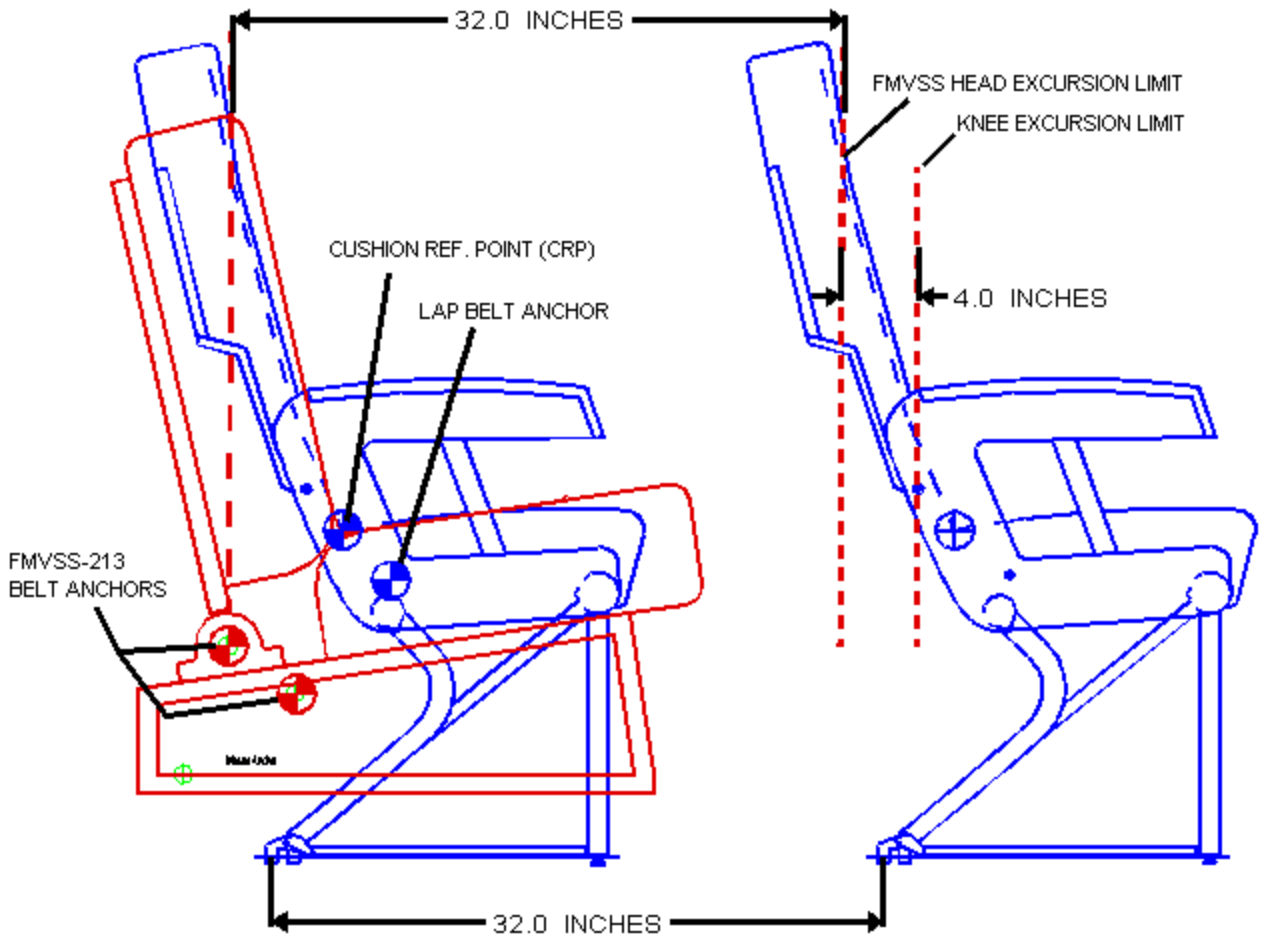
"Approved" Child Restraint Devices in the US are ***designed*** to ***perform*** to the standards specified in FMVSS-213 (49 CFR 571.213)

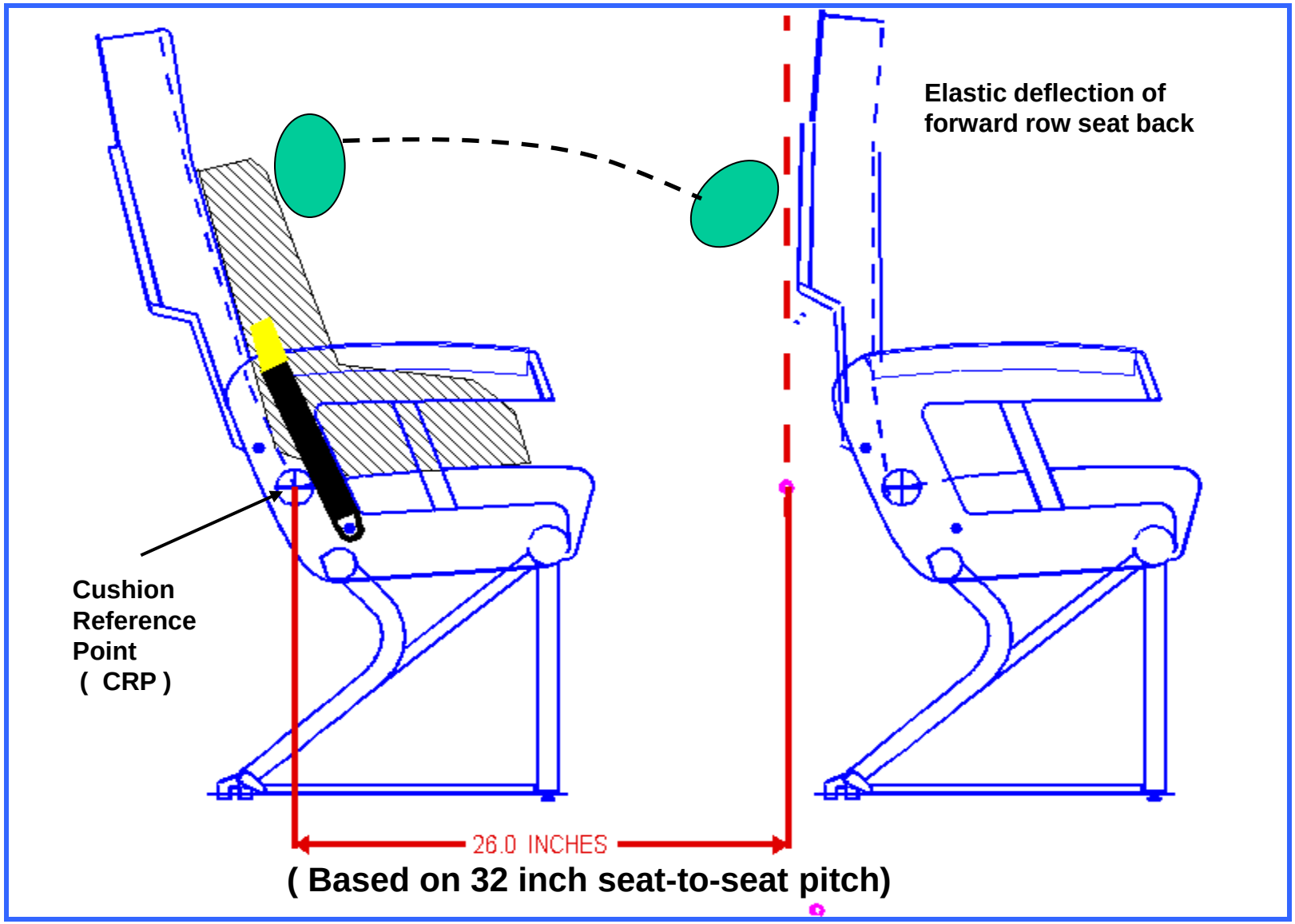
The dynamic test procedures specified in FMVSS-213 are based on an automobile seat environment, including the restraints, seat dimensions, and proximity to forward structures.

Differences between the typical airplane passenger seat and the automobile seat represented in FMVSS-213 adversely affect the performance of child restraints in airplane seats.

## Current Performance Criteria per FMVSS-213

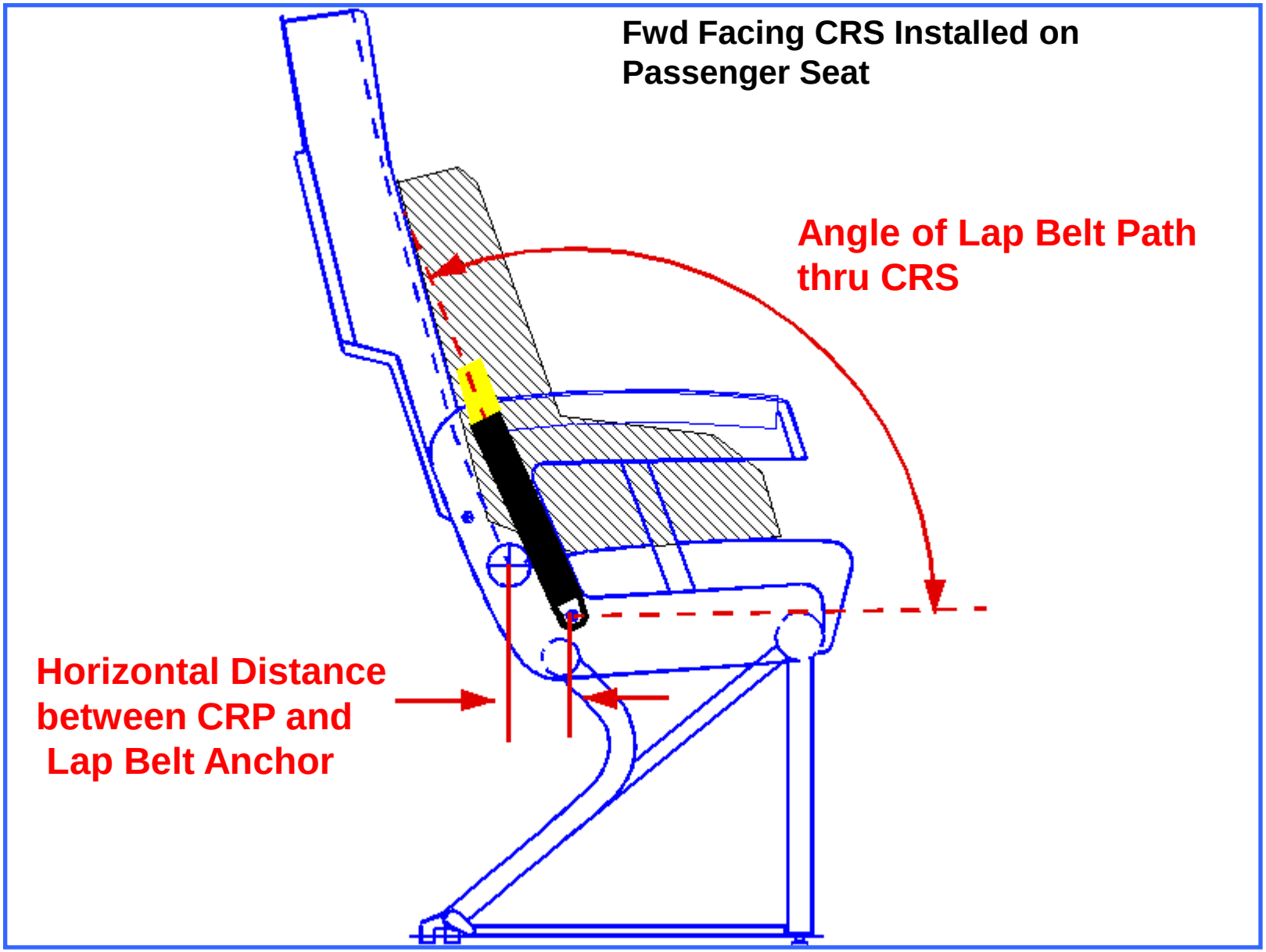


# Estimate of available head “non-contact” space in 16g test conditions




( Based on 32 inch seat-to-seat pitch)

## Key variables that affect retention of CRS in passenger seat



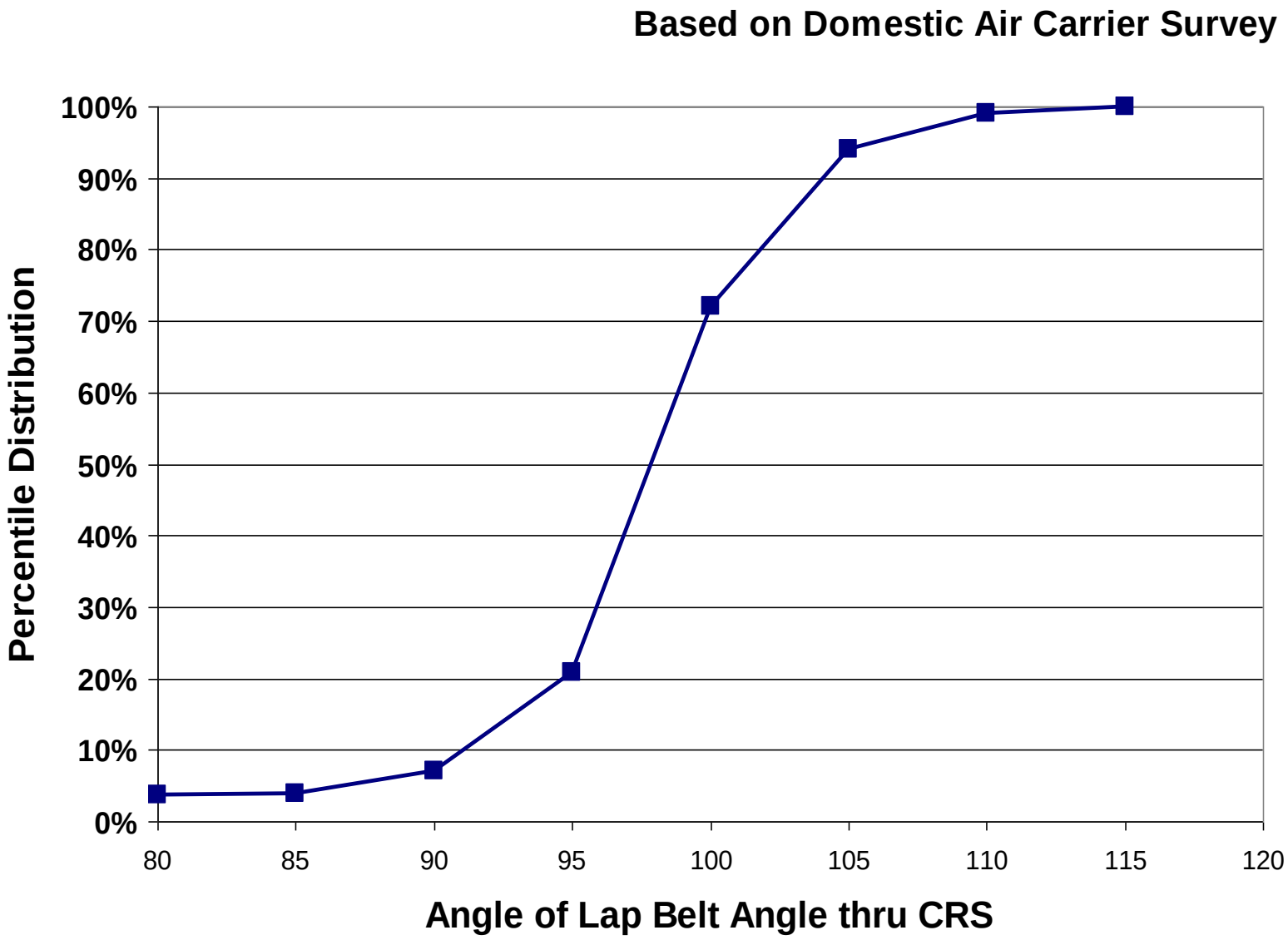
## Example of alternate installation method ...

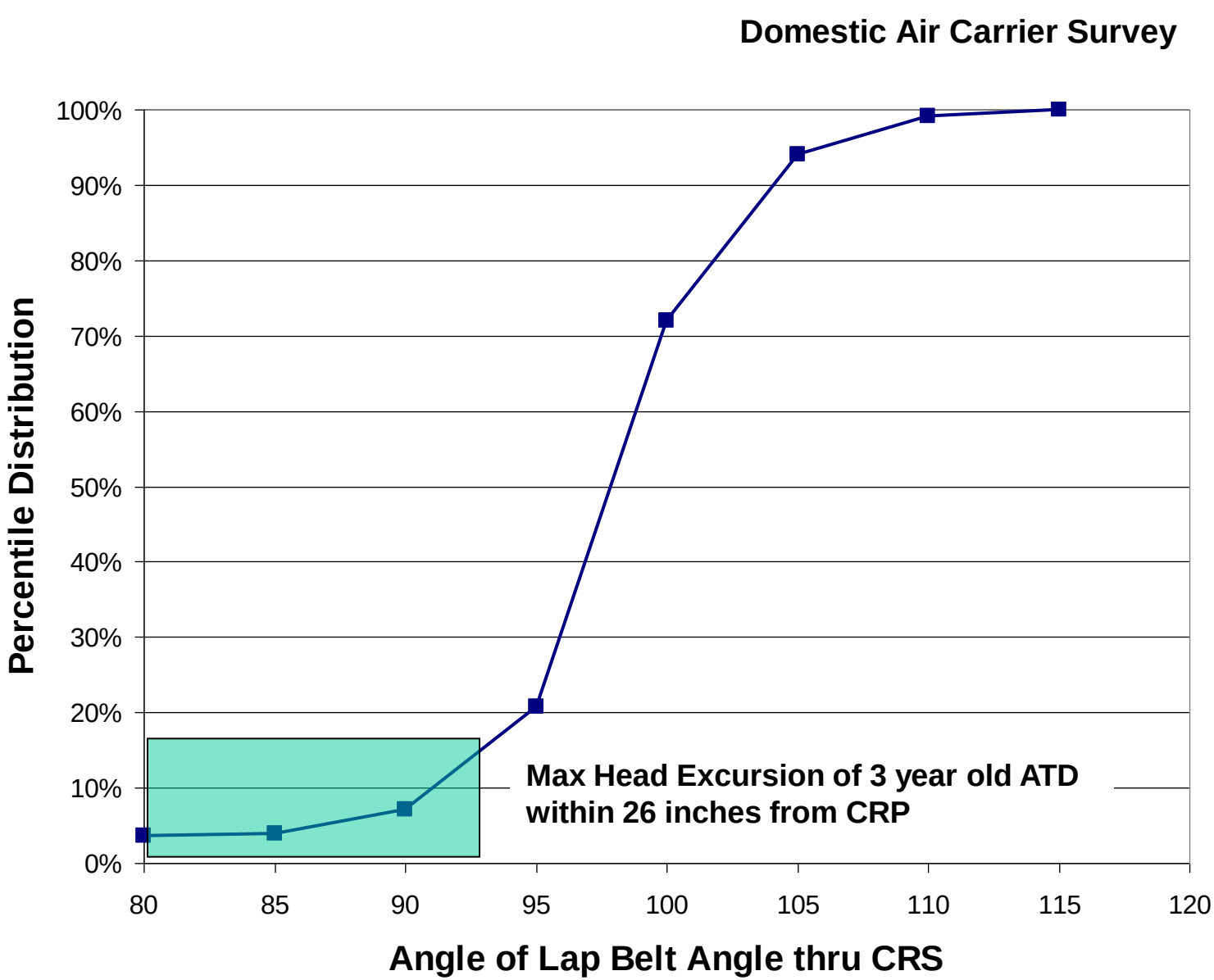
# Example of CRS in commuter passenger seat


# Example of poor interface between CRS and passenger seat


# 1996 Survey of US Domestic Air Carriers CRP-to-Lap Belt Anchor Dimensions

- Obtained thru cooperative efforts of SAE S-9 sub committee and ATA
- Data submitted from 5 airlines
- Over 180,000 seat places included in data,  most were TSO C-39 type
- Only data from economy seats were included in analysis


Based on Domestic Air Carrier Survey
Percentile Distribution
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
80
85
90
95
100
105
110
115
120
Angle of Lap Belt Angle thru CRS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95
100
105
110
115
120
Angle of Lap Belt Angle thru CRS
Max Head Excursion of 3 year old ATD
within 26 inches from CRP

Another interface issue..

Forward facing CRS

Lap belt buckle interference with CRS belt slot

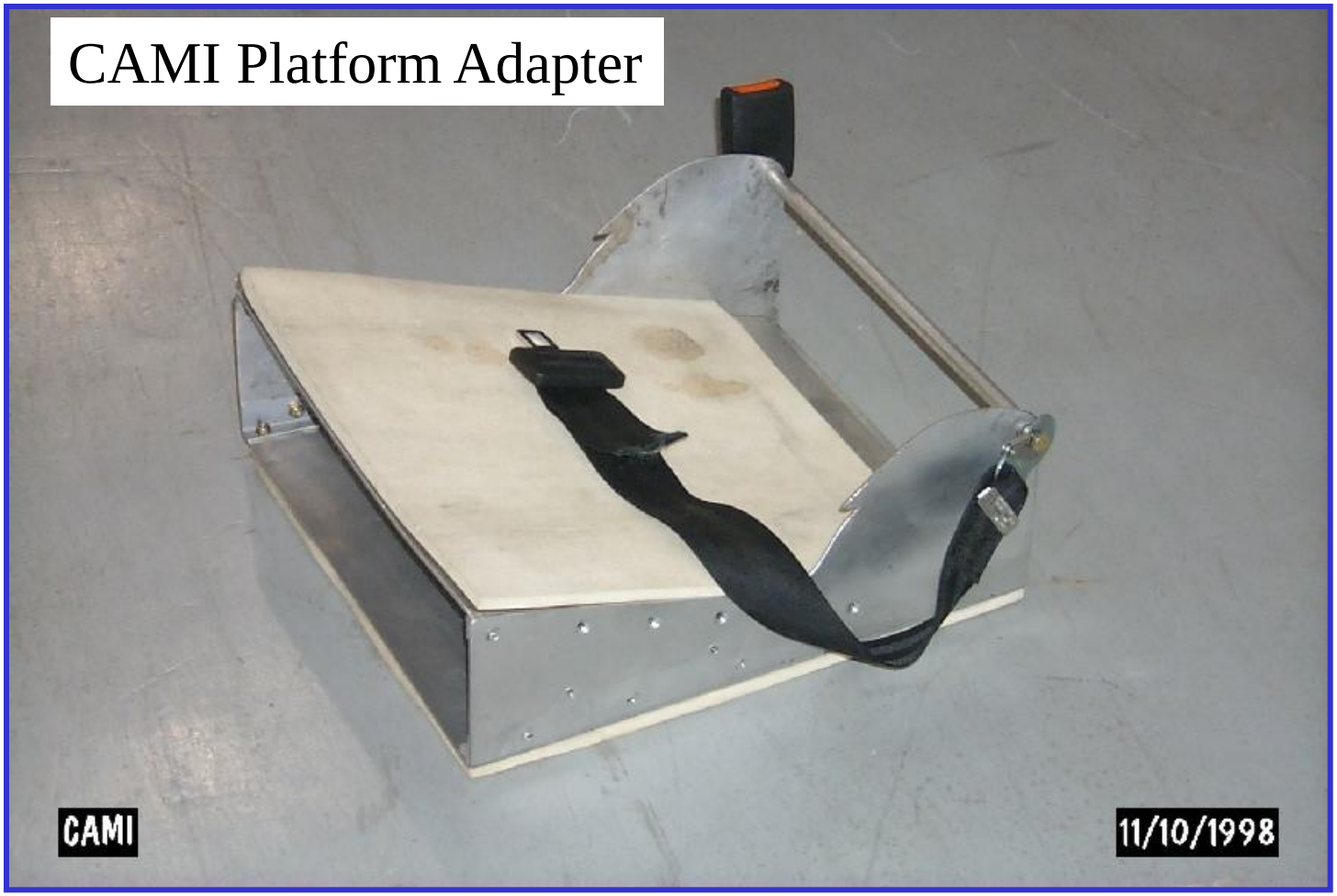
Effects of poor belt anchor interface, combined with lap belt buckle interference with CRS:  Loose coupling with airplane seat.

Design and Performance Dilemma:

FMVSS-213 does not provide the means to assess the representative airplane seat and installation environment.

Airplane seats have not been designed to accommodate child restraints in a manner that provides a secure interface between a forward facing CRS and the seat's lap belts.

Potential for improved interface between CRS and airplane passenger seats?



# CAMI Platform ...


Further information regarding the information in this presentation via the internet …

www.cami.jccbi.gov

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Select: **Biodynamics Research Team**